

Food availability, toxic substances, and competition and predation are among the factors influencing abundance of resident species. In addition, harvest of many resident species for food and bait by sport anglers may affect abundance.



VISION

The vision for native resident fish species is to maintain and restore the distribution and abundance of native species to contribute to the overall species richness and diversity.

Achieving this vision will reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.

Ecosystem processes are closely tied to habitat restoration needs and actions. Resident species would benefit from conditions to maintain productivity and suitability of spawning and rearing habitat (including production of food). Actions to rehabilitate ecosystem processes include: changing Delta configuration, facility operations (including Delta diversions and channel barriers and gates), and Delta inflow and outflow.

Stressor reduction is a major component of restoration and maintenance of resident species populations. A primary concern with regard to vulnerable species is the reduction of losses to diversions. Actions to reduce losses include upgrading existing fish protection facilities, installing fish screens on currently unscreened facilities, removing predators associated with diversions and fish protection facilities, relocating and consolidating existing diversions, changing seasonal timing of diversions, and reducing the number of diversions. Resident species would also benefit from actions to reduce pollutant input to streams and rivers in the Sacramento-San Joaquin River basin and may benefit from actions to prevent introduction of non-native species that would prey upon or compete with native species for habitat and food supply.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

Efforts to restore and maintain resident species would involve cooperation and support from other established programs that protect and improve

conditions for delta smelt, striped bass, and other species.

- The Recovery Plan for the Sacramento/San Joaquin Delta native fishes will be considered in the development of actions.
- Central Valley Project Improvement Act will implement actions that will benefit resident species, including changing the timing of diversions and restoring habitat.
- The State Water Resources Control Board will implement the Water Quality Control Plan for the San Francisco/Sacramento-San Joaquin Delta estuary that will include provisions to limit entrainment in diversions and protect habitat conditions for Sacramento splittail, chinook salmon, striped bass, and other species.

LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Restoration efforts relating to resident fish will be closely tied with efforts for delta smelt, longfin smelt, and splittail.

OBJECTIVE, TARGETS, AND ACTIONS



The Strategic Objective is to enhance and/or conserve native biotic communities in the Bay-Delta estuary and its watershed.

SPECIES TARGET: Maintain self-sustaining populations of all native resident fishes throughout their native ranges in the ERP Ecological Management Zones.

LONG-TERM OBJECTIVE: Within 25 years, all resident native fishes will have stable or increasing populations, in multiple localities, with localities interconnected as much as feasible.

SHORT-TERM OBJECTIVE: Determine the distribution, status, and habitat requirements of all native resident fishes in the Bay-Delta watershed to see if species-specific strategies are needed to reverse declines or if habitat-oriented restoration strategies will be adequate.

RATIONALE: The Central Valley has a native resident fish fauna that is largely endemic to the region. Some species are extinct (thicktail chub) or nearly extinct (Sacramento perch) in the wild. While some native species (e.g., Sacramento pikeminnow [squawfish], Sacramento sucker) are clearly thriving under altered conditions, others are not (e.g., hitch, Sacramento blackfish, hardhead). Although most of these species may benefit from actions listed under goal 2, there is a need to determine if some have unique problems or requirements that will prevent them from responding to general habitat improvements.

STAGE 1 EXPECTATIONS: A distribution and status survey of native stream fishes will have been completed. Sites with high species richness or containing rare species will have been identified for special management. A recovery strategy for native fish assemblages will have been developed.

RESTORATION ACTIONS

The target for resident fishes is to increase their abundance indices in the DFG fall midwater trawl survey and Suisun Marsh Trawl Survey to historical levels (e.g., 20 units or higher in the Suisun marsh Trawl survey).

Resident species would benefit from the following general restoration activities:

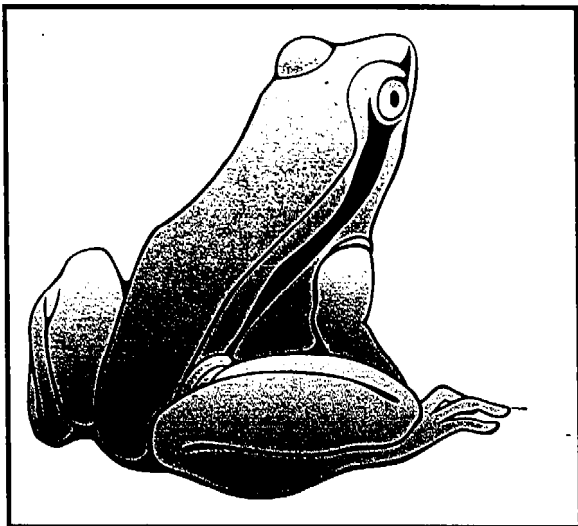
- adding and modifying physical habitat,
- breaching levees to inundate existing islands,
- setting levees back to increase shallow-water habitat along existing channels,
- restoring riparian areas,
- protecting existing shallow-water habitat from erosion,
- filling relatively deep water areas with sediment to create shallow-water habitat,
- eliminating water hyacinth and other noxious aquatic plants from Delta channels and sloughs,
- upgrading existing fish protection facilities at South Delta pumping plants,
- installing screens on unscreened diversions,
- removing predators at diversions,

- relocating or consolidating diversions,
- reducing concentrations of toxins in Bay-Delta waters, and
- preventing further introductions of non-native aquatic organisms.

REFERENCE

Strategic Plan for Ecosystem Restoration. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.

◆ NATIVE ANURAN AMPHIBIANS



INTRODUCTION

Anuran amphibians include tailed frogs, spadefoot toads, true toads, treefrogs, and true frogs. There are several species that have been listed in California that could be further impacted by CALFED, including the Yosemite toad, western spadefoot, California red-legged frog, Cascades frog, foothill yellow-legged frog, and mountain yellow-legged frog. These species have been impacted by habitat loss as well as by predation by introduced species. For more specific information on western spadefoot and California red-legged frogs refer to their previously presented sections.

RESOURCE DESCRIPTION

The species that may be affected by CALFED occur in different areas in the valley and watersheds of California and there are differing resource requirements for each species. Habitat requirements are varied including vernal pools, grassland, valley-foothill hardwood woodlands, montane wet meadows, and hardwood-conifer seasonal ponds associated with lodgepole pine, ponderosa pine, and subalpine conifer forests, quiet pools in marshes, stock ponds, mountain lakes and streams, valley-foothill riparian, coastal scrub, and mixed chaparral. Water is essential for the anurans, yellow-legged frogs prefer partially shaded, moving water that stays cool all year. Stream alteration such as dams, clearing and destruction of natural water courses, and ponds

increases ambient water temperatures and makes habitat unsuitable. Cascades frogs need standing water for reproduction and hibernate at the bottom of mountain lakes and ponds during the winter. Optimal habitat for Yosemite toads is mountain ponds and wet meadows where they lay their eggs in still water. During inactive periods they will hide in rodent burrows or move to adjacent forests. When disturbed they will often hop into nearby water.

Reproductive methods and habitat selection for spawning varies among the species. Foothill and mountain yellow-legged frogs lay egg masses on cobble sized gravel or rocks. Foothill yellow-legged frogs need cool water for proper development. Mountain yellow-legged frogs do not start reproduction until the ice melts in the lakes and streams and tadpoles may need up to two overwintering periods to complete their development. The Cascades frog deposits eggs in clear shallow water with gravelly, sandy or silty bottoms, while the Yosemite toad lays its eggs in shallow, quiet pools. Most eat terrestrial and aquatic insects, worms, fish, smaller amphibians, and other tadpoles.

The populations have declined due to habitat loss and predation by bullfrogs and centrarchids. Introduction of bullfrogs and centrarchids to many inland streams and ponds has resulted in predation of all life stages of the native anurans. They have not been found to coexist with bullfrogs without bullfrogs becoming the prevailing species.



VISION

The vision for native anuran amphibians is to contribute to their restoration.

This will be accomplished by stopping habitat loss and the introduction of other species that prey on the different life stages of these amphibians. Ongoing surveys to monitor known populations and find subsequent populations is essential to gauge the health of the species. To stabilize and increase anuran populations, non-native predator species should be eliminated from historical habitat ranges. Increasing suitable habitat and having clean water supplies that fit the needs for the different species is essential. It

will be essential to reintroduce anurans to a reclaimed area after habitat requirements are met.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

Restoration and management programs that could benefit anuran populations and that would improve habitat include:

- the Agricultural Stabilization and Conservation Service's Wetland Reserve Program,
- the Wildlife Conservation Board's Inland Wetlands Conservation Program,
- restoration programs administered by Ducks Unlimited and the California Waterfowl Association,
- on going management of State and Federal wildlife refuges and private duck clubs, and
- Efforts by CALFED Common Programs will benefit some anuran species in the upper watersheds.

Restoration efforts will be in cooperation with other agencies that have authority to conduct restoration projects including:

- California Department of Fish and Game
- California Department of Water Resources
- U.S. Fish and Wildlife Service, and
- U.S. Army Corp of Engineers.

LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Restoration of native anuran amphibian populations will also effect restoration of reptiles and other amphibians that coexist in the same types of habitats. It will be linked to restoring the overall health to many different types of habitats within the Central Valley as well as the Cascade, Coast, and Sierra mountain ranges.

OBJECTIVE, TARGETS, AND ACTIONS



The Strategic Objective is to enhance and/or conserve native biotic communities in the Bay-Delta estuary and its watershed.

SPECIES TARGET: Maintain self-sustaining populations of all native anuran amphibians throughout their native ranges in the ERP Ecological Management Zones.

LONG-TERM OBJECTIVE: Have self-sustaining populations of all native anuran amphibians (frogs, toads) present throughout their native ranges, in all major watersheds in the Bay-Delta watershed.

SHORT-TERM OBJECTIVE: Determine the causes of anuran amphibian declines in the Bay-Delta watershed, develop restoration strategies, and implement them where feasible.

RATIONALE: The frogs and toads of California are in a general state of decline, but especially in the Central Valley watershed. The ranid frogs (red-legged frog, foothill yellow-legged frog, mountain yellow-legged frog, cascades frog) are in steep decline. Foothill yellow-legged frogs, for example, have virtually disappeared from the San Joaquin drainage since the 1970s (when they were still common). Red-legged frogs have become so rare they are federally listed as endangered (and are treated separately as a consequence). Although the decline of these amphibians can be tied to global amphibian declines, the principal causes are probably regional: introduced species and airborne pesticides. Because pesticides also have effects on human health, any changes in farming practices to protect humans also should be designed to protect amphibians.

STAGE 1 EXPECTATIONS: Complete status surveys of all anuran amphibians will have been completed and the major causes of declines should be determined. Long-term plans will have been developed and instituted to create conditions that will allow populations to recover throughout their ranges.

RESTORATION ACTIONS

The general target is to increase population sizes and distribution of the native anurans through our historical habitat ranges.

General programmatic actions to assist in reaching the target include:

- acquire land that would increase anuran habitat and develop good water sources that meet population needs.
- develop predator control plans for bullfrogs and centrarchids,
- reintroduce native anurans to habitats that predators are eliminated.

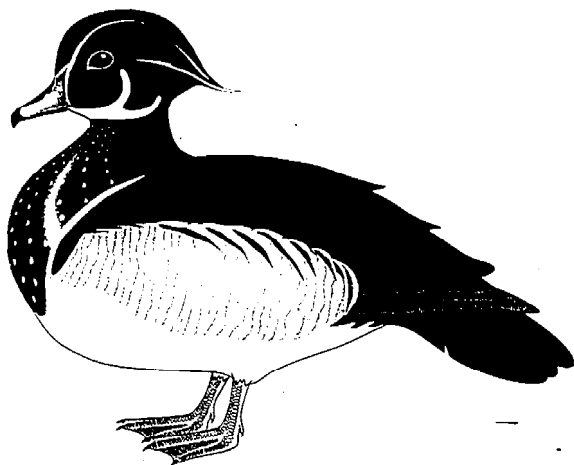
REFERENCES

Multi-Species Conservation Strategy. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.

Strategic Plan for Ecosystem Restoration. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.

United States Fish and Wildlife Service, Status and Trends Report on Wildlife of the San Francisco Estuary, San Francisco Estuary Project, 1992.

Zeiner, David C., William F. Laudenslayer, Jr., Kenneth E. Mayer (ed.), California's Wildlife Volume 1 Amphibians and Reptiles, Department of Fish and Game, Sacramento, 1988.



INTRODUCTION

Central Valley waterfowl populations are a highly valued and diversified biological resource and are found in all ecological management zones within the study area. Large numbers of ducks, geese, and swans winter in the Central Valley after migrating from northern breeding areas. Some species, such as the mallard, gadwall, and Canada goose, are also year-long residents and breed locally in wetlands and nearby uplands. Waterfowl are a significant component of the ecosystem, are of high interest to recreational hunters and bird watchers, and contribute to California's economy through the sale of hunting and related equipment. Historical waterfowl wintering habitat areas have declined by approximately 95% and, as a result of substantial losses of wetland and grassland habitats, waterfowl breeding populations have declined from historical levels.

Major factors that limit this resource's contribution to the health of the Delta are related to adverse effects of conversion of wetland and grassland habitats to agricultural, industrial, and urban uses.

RESOURCE DESCRIPTION

Migration over long distances requires a great amount of energy. Upon arrival to wintering grounds, waterfowl depend on high-quality foraging habitat with sufficient grains, insects, and aquatic plants to replenish their energy reserves. These

habitats include seasonal, permanent, tidal, and agricultural wetlands; deepwater; riparian woodlands; grasslands; and agricultural uplands and other associated habitats.

Recent declines in waterfowl populations are attributed primarily to the cumulative degradation or loss of breeding, wintering, and foraging habitats in the Central Valley and outside of California. Population declines are most likely caused by a combination of factors that have reduced or eliminated important ecosystem processes. These factors include:

- loss of natural wetlands because of altered flow regimes, resulting in the loss of natural floodplains;
- fragmentation or loss of large areas of wetlands as a result of land reclamation;
- loss of shallow-water habitat as a result of flood management practices;
- loss of riparian habitat resulting from channelization and levee protection practices;
- loss of tidal wetlands as a result of dikes and levees for flood control;
- heavy metal contamination from sources such as subsurface agriculture drainage; and
- loss of the natural mosaic of habitats required to meet the life requirements of waterfowl.

Many other factors have also contributed to the decline of waterfowl, although perhaps to a lesser degree. These include high concentrations of waterfowl in relatively small areas, which exposes greater portions of the population to diseases (such as botulism and cholera) and predation on nests and young by non-native species. Other factors that can affect waterfowl populations, such as extended periods of drought, are natural and will remain.

The Aleutian Canada goose is one of the MSCS evaluated species for which a MSCS species goal of maintain has been established. Although this federally listed species is not discussed in a separate section, it is included in the overall discussion of

waterfowl. The MSCS provides one conservation measure for this species (see MSCS Conservation Measures later in this section).



VISION

The vision for waterfowl is to maintain healthy populations at levels that can support consumptive (e.g., hunting) and nonconsumptive (e.g., birdwatching) uses consistent with the goals and objectives of the Central Valley Habitat Joint Venture as part of the North American Waterfowl Management Plan.

Protecting existing and restoring additional suitable seasonal, permanent, and tidal wetlands; deepwater; riparian woodlands; and grasslands; and other associated habitats and improving agricultural land management and reducing the effect of breeding stressors will be critical to maintaining healthy waterfowl populations in the Bay-Delta. Large-scale restoration of nesting, brood, and foraging habitat will help to reduce predation on nests and young. Diverse and wide-spread habitats decrease the likelihood of large-scale outbreaks of disease. Habitat restoration in the Sacramento-San Joaquin Delta and Suisun Marsh/North San Francisco Bay Ecological Management Zones will help to maintain healthy populations of waterfowl by increasing the quality and quantity of habitats used by these species.

Efforts under existing migratory bird management programs have significantly improved critical habitats, including water management for seasonally managed agriculture fields, development of permanent habitat on federal refuges in the State wildlife areas, and incentives for private landowners to provide wintering habitat for migratory waterfowl.

Restoration of ecosystem processes and habitats proposed by ERPP in other ecological management zones will also allow floodplain wetland, riparian, and upland habitats to develop that will provide habitat for waterfowl elsewhere in the Central Valley.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

Some of the programs that are restoring populations and habitat for waterfowl in the study area include:

- Upper Sacramento River Fishery and Riparian Habitat Council (SB 1086) Program,
- Suisun Marsh Protection Plan,
- California Department of Fish and Game wildlife areas,
- U.S. Fish and Wildlife Service refuges,
- The Nature Conservancy's Jepson Prairie Preserve,
- Ducks Unlimited Valley Care Program
- California Waterfowl Association,
- Cache Creek Corridor Restoration Plan,
- Putah Creek South Fork Preserve,
- Woodbridge Ecological Reserve,
- Yolo County Habitat Conservation Plan, and
- Central Valley Habitat Joint Venture

LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Protection and restoration of waterfowl populations is integrally linked with restoration of perennial aquatic, wetland, tidal slough, riparian, grassland, and agricultural habitats and reduction in contaminants such as selenium in Central Valley breeding and wintering areas.

STRATEGIC OBJECTIVE, TARGETS, AND PROGRAMMATIC ACTIONS



One Strategic Objective for waterfowl is to enhance and/or conserve native biotic communities in the Bay-Delta estuary and its watershed.



A second Strategic Objective is to enhance populations of waterfowl and upland game for harvest by hunting and for nonconsumptive recreation.

SPECIES TARGET: Improve populations and distribution of waterfowl.

LONG-TERM OBJECTIVE: Substantially increase the numbers of resident and migratory ducks and geese that use the Bay-Delta watershed by increasing habitat available to them.

SHORT-TERM OBJECTIVE: Continue restoration of wetlands suitable for waterfowl production and over-wintering, while developing strategies for management of waterfowl areas that are compatible with other species, habitat, and ecosystem process restoration goals.

RATIONALE: Waterfowl resources will be enhanced by protecting existing and restoring additional seasonal, permanent, and tidal wetlands. Improved management of agricultural lands using wildlife friendly methods will contribute to sustaining waterfowl resources in the Bay-Delta. The focus for seasonal wetlands should be in areas that may be too deep for tidal marsh restoration over the next 20 years. In concert with efforts to reduce or reverse subsidence, selected areas or islands would be managed as waterfowl habitat. Besides increasing waterfowl resources, efforts to sustain waterfowl and their habitat will help offset some of the effects of converting agricultural or seasonal wetlands to tidal action when such actions may reduce the value of an area to waterfowl such as white-fronted geese or mallard. Efforts should also be focused on improving waterfowl nesting success by improving nesting and brood habitat. Improving waterfowl populations will be done in a manner that reduces conflict with broader ecosystem restoration goals or with goals to recover endangered species. For example: Flooding of rice fields for waterfowl in late winter may require water needed by migratory salmon. Careful management of the amount and timing of those diversions and the manner in which the diversions occur (e.g. through screened diversions) can help reduce conflicts. Management of waterfowl areas will occur using management strategies developed for existing and new waterfowl areas that provide benefits to at-risk species.

STAGE 1 EXPECTATIONS: Acquisition and development of new wetlands favorable for wintering and nesting waterfowl (e.g., Yolo Basin Wildlife Area) will have continued. Significant areas of existing agriculture will be managed using wildlife

friendly practices. For existing public wildlife areas, plans to reduce conflicts between waterfowl management and management for other native species, including provisions for emergency situations (e.g., levee repairs), will have been developed. For private waterfowl areas, incentives for implementing broader, ecosystem-based management goals will have improved.

RESTORATION ACTIONS

The following general targets will assist in meeting the implementation objective:

- Increase waterfowl populations, and
- Increase distribution of waterfowl.

The following general programmatic actions will assist in meeting the targets:

- implementing management strategies to protect important existing habitat areas,
- increasing the quantity and quality of breeding habitat and forage on agricultural land,
- establishing new programs or expanding existing programs to provide incentives for landowner participation,
- restoring and improving wetlands in conjunction with adjacent herbaceous uplands to improve breeding habitat,
- expanding existing State and Federal wildlife areas by creating additional wetland complexes,
- improving water quality, and
- establishing programs that allow government agencies and waterfowl conservation organizations to work cooperatively to increase the efficiency of existing strategies and waterfowl management plans.

MSCS CONSERVATION MEASURES

The following conservation measure was included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve species habitat or population targets for Aleutian Canada goose.

- To the extent consistent with ERP objectives, direct proposed actions for improving agricultural habitats for wildlife to protecting and improving traditional wintering habitat use areas.

REFERENCES

Multi-Species Conservation Strategy. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.

Strategic Plan for Ecosystem Restoration. 2000. CALFED Bay-Delta Program, Programmatic EIS/EIR Technical Appendix. July 2000.

◆ SHOREBIRD AND WADING BIRD GUILD



INTRODUCTION

Over a million shorebirds and wading birds annually migrate through, winter, or breed in the Bay-Delta. Representative species of the shorebird and wading bird guild include the great blue heron, great egret, western sandpiper, and long-billed dowitcher. These species are a significant component of the ecosystem, are of high interest to recreational bird watchers, and contribute to California's economy through sales of equipment and other bird-watching-related expenditures. There have been substantial losses of historic habitat used by these species and available information suggests that population levels of many of these species are declining. Major factors that limit this resource's contribution to the health of the Delta are related to adverse effects of conversion of native habitats for agricultural, industrial, and urban uses and land and water management practices that degrade habitats used by these species.

RESOURCE DESCRIPTION

Some shorebird and wading bird species are winter migrants limited to shallow water areas and shorelines. Others are statewide, year-round residents. Shorebirds and wading birds are dependent on many different habitats, although each species

may be dependent on only one or a few habitats. These habitats include perennial aquatic, tidal slough, seasonal and emergent wetland, midchannel island and shoal, riparian, and agricultural.

Shorebirds and wading birds are present throughout the Central Valley. Herons and egrets are common year-round residents that breed and winter throughout the study area. Most shorebirds are only winter residents, with a small number remaining to breed. Wetland habitat conversion has eliminated 95% of the historic wetland habitat, resulting in smaller, detached patches of suitable habitat for nesting and foraging. Riparian habitats suitable for use by colonial-nesting species, such as egrets, have been lost or fragmented and are subject to increased disturbance during the nesting period.



VISION

The vision for the shorebird and wading bird guild is to maintain healthy populations of shorebirds and wading birds through habitat protection and restoration and reduction in stressors.

Protecting existing and restoring additional suitable perennial aquatic, tidal slough, seasonal and emergent wetland, midchannel island and shoal, and riparian habitats and improving management of agricultural lands and reducing the effect of factors that can suppress breeding success will be critical to maintaining healthy shorebird and wading bird populations in the Bay-Delta. Restoration of these habitats in the Sacramento-San Joaquin Delta and Suisun Marsh/North San Francisco Bay Ecological Zones will help to maintain healthy populations by increasing the quality and quantity of habitats used by these species.

Shorebirds and wading birds would also benefit from:

- management strategies that protect and maintain important existing habitat areas,
- project wetlands and wading bird nesting areas,
- improve habitat quality for shorebirds and wading birds.